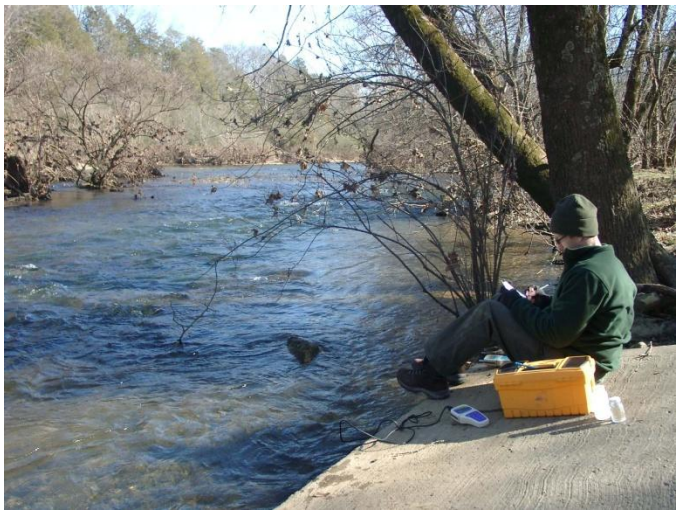
Stones River National Battlefield
Water Quality Summary Fiscal Year 2010

Water quality at Stones River National Battlefield remains fair.



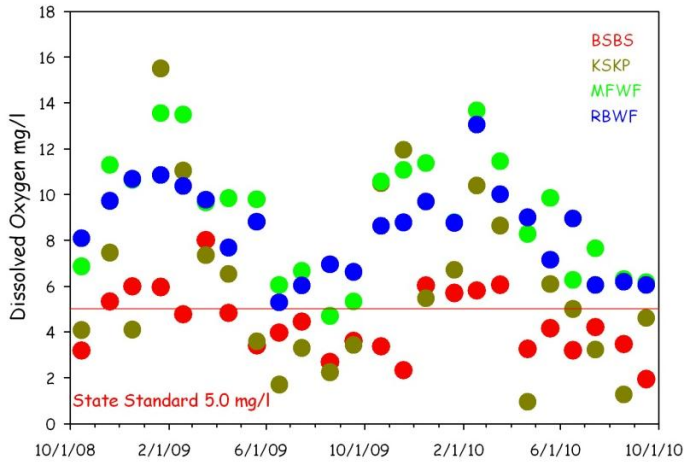
NPS ecologist Bill Moore samples water quality at McFadden's Ford, January 21, 2009. Image by Joe Meiman.

The Cumberland Piedmont Network Inventory and Monitoring Program began long-term water quality monitoring at Stones River National Battlefield in fiscal year 2003. Water quality is measured every month for two years, followed by a five year hiatus (concordant with the US Geological Survey's national long-term national water quality program). Water quality is measured at four sites; West Fork Stones River at Redoubt Brannan and McFadden Ford, King's Pond Spring which flows to the forth site, Battlefield Spring near the river. Based upon program requirements and findings of the water quality inventory, a set of parameters was chosen for long-term monitoring; including the field measures of water temperature, specific conductance (SpC), pH, and dissolved oxygen (DO). Samples were also collected for analysis for *Escherichia coli (E. coli)* and nitrate.

Highlights of Fiscal Year 2010 Monitoring

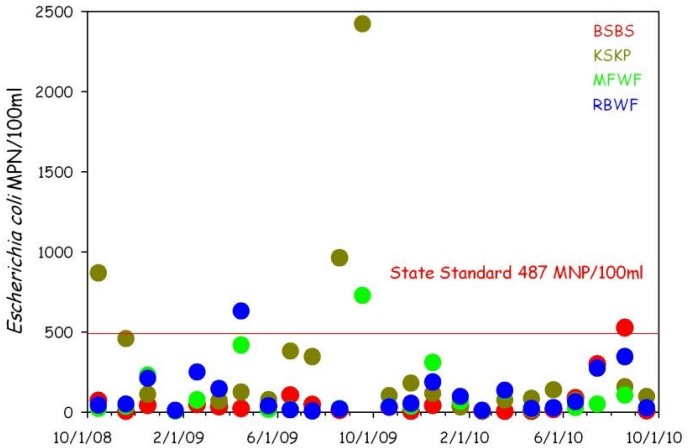
Of 576 measurements with assigned state water quality standards there were seven violations. There were an additional 27 apparent exceedances that are considered to reflect natural conditions. Battlefield Spring (16 occasions) and King's Pond Spring (11 instances) were below the state minimum DO standard of 5.0 mg/l over the course of 24 sampling events. As these springs are primarily recharged through overlying epikarst – the uppermost weather portion of limestone – there is little opportunity to dissolve oxygen into the water, thus the DO of these springs is naturally low.

During the August 2009 sample round the DO at McFadden's Ford was just below the state standard. Although the river is well aerated, DO levels can be compromised during hot summer months; the warmer the water the less oxygen can be dissolved.

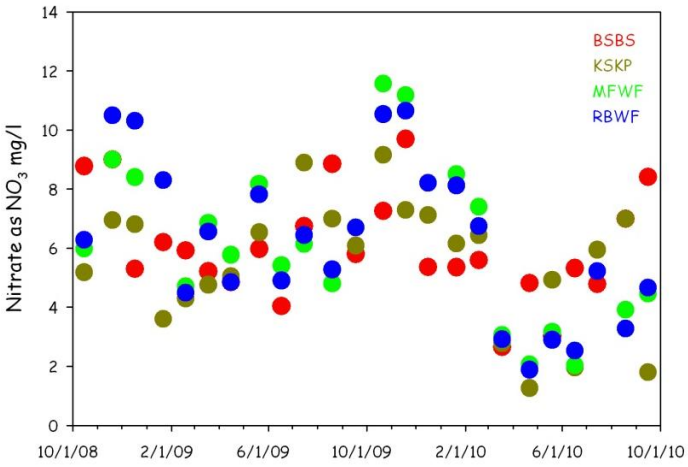


The naturally low DO of Battlefield and King's Pond Spring comprise most of the deficient DO values at the park.

On six occasions *E. coli* levels were above the state single sample standard of 487 Most Probable Number (MPN)/100 ml – each site violating the standard at least once. The bulk of *E. coli* in the West Fork Stones River is from non-point sources. Values dramatically increase following rainfall as animal waste is washed into the streams as runoff. High *E. coli* at King's Pond Spring is due to it being a wildlife watering hole. In August 2010, two weeks after a 100,000 gallon sewer leak upstream of the park, *E. coli* levels were still slightly elevated.



E. coli *results showing occasional exceedances of the state standard of 487 MPN/100ml.*



Nitrate levels at Stones River National Battlefield.

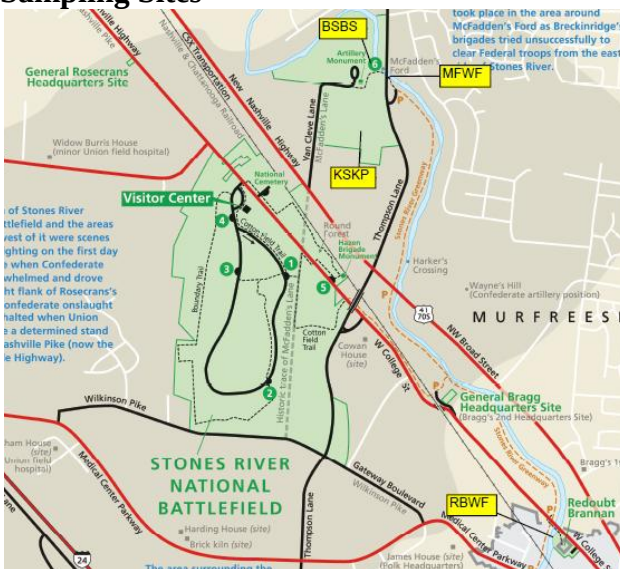
While well below the USEPA recommended limit of 90 mg/l for freshwater aquatic life, nitrate concentrations have been found to be slightly elevated in the West Fork Stones River. For reference, the USEPA drinking water standard for nitrate is 45 mg/l.

Water Quality Standards

All park waters are considered "Exceptional Tennessee Waters" which prohibit discharge and other pollution sources, while criteria are defined as Tennessee's "Fish & Aquatic Life and Recreational" standards, a combination of the highest standards under the Clean Water Act as promulgated by the state. The two river sites are considered support recreational use. Specific Conductance is without state standards or federal guidelines. These parameters are useful in interpreting water quality. We also use the USEPA freshwater aquatic life recommendation for nitrate of 90 mg/l.

Water Temperature	Not to exceed 30.5°C
Dissolved Oxygen	Not to deceed 5.0 mg/l
pH	Between 6.0 and 9.0 SU
Escherichia coli	Not to exceed 487 MPN/100ml
SpC	No Standard
Nitrate	Not to exceed 90 mg/l

Sampling Sites



BSBS Battlefield Spring
MFWF McFadden's Ford, West Fork Stones River
KSKP King's Pond Spring
RBMF Redoubt Brannan, West Fork Stones River

Future Monitoring

Water quality sampling is scheduled to resume in fiscal year 2016.

Water quality data are available upon request to the Cumberland Piedmont Network or our website:
http://science.nature.nps.gov/im/units/cupn/reports.cfm